AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 6.2.1.1

Standard circuit diagram symbols

Mark schemes and examiner comments

Tier	**Foundation**
Question groups	**8**
Available paper years	**2018–2025**

Using this booklet

1. Booklet answer numbers match the question booklet.
2. Use the original question number within marking tables.
3. Examiner comments are included where available.

Name: _____ **Date:** _____

Where a precise marking extract is unavailable, the full source document is included in an appendix. Any missing mark scheme is explicitly identified.

6.2.1.1 Standard circuit diagram symbols

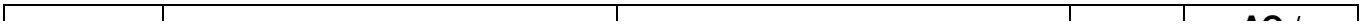
Answer 01 · Mark scheme June 2018 | 8464/P/1F | Original Q4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	(casing is) not made of metal little / no chance of electric shock	allow (casing is) made of plastic allow they are double insulated	1 1	AO3 6.2.3.2
04.2	charge flow = current × time	allow the equation given in symbols	1	AO1 6.2.1.2
04.3	Q = 2.95 × 60 Q = 177 (C)	an answer of 177 scores **2** marks allow 180 (C)	1 1	AO2 6.2.1.2
04.4	straight line with a different positive gradient straight line with positive gradient through the origin	must go through the first and third quadrant	1 1	AO1 6.2.1.4
04.5			1	AO1 6.2.1.1
04.6	the particles vibrate about a fixed position regular arrangement (the particles change) to being free to move around	allow the particles are in a regular arrangement allow correct description of translational kinetic energy	1 1	AO1 6.3.1.1
04.7	 L = 200 000 (J/kg) E = 500 × 200 000 E = 100 000 000 (J)	an answer of 100 000 000 scores **3** marks allow 1×10^8 (J) allow correct calculation for incorrect conversion or no conversion of L for **2** marks	 1 1 1	AO2 6.3.2.3
Total			**13**	

6.2.1.1 Standard circuit diagram symbols

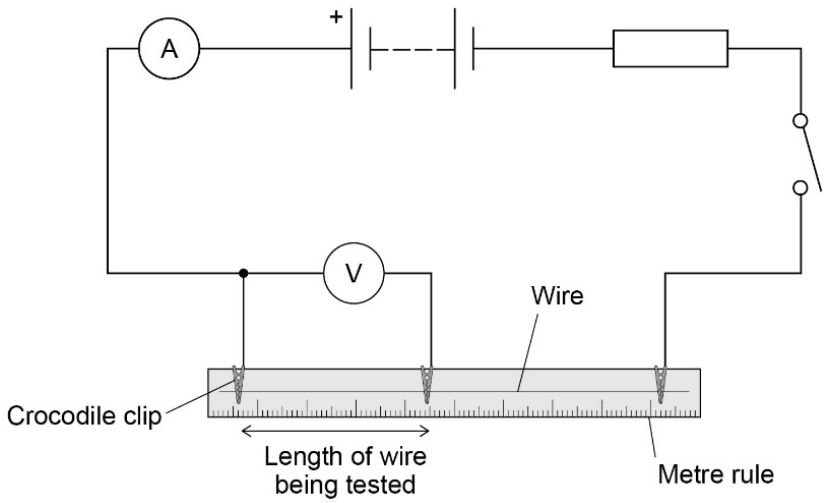
Answer 01 · Mark scheme

June 2018 | 8464/P/1F | Original Q4



6.2.1.1 Standard circuit diagram symbols

Answer 02 · Mark scheme November 2020 | 8464/P/1F | Original Q1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	both symbols correct and in the correct position  		1	AO1 6.2.1.3 6.2.1.4 RPA 15
01.2	the length of the wire being tested		1	AO1 6.2.1.3 RPA 15
01.3	the resistance of the wire		1	AO1 6.2.1.3 RPA 15
01.4	mean p.d. = $\frac{0.16 + 0.17 + 0.15}{3}$ mean p.d. = 0.16 (V)		1 1	AO2 6.2.1.3 RPA 15
01.5	R = 0.32/0.50 R = 0.64 (Ω)		1 1	AO2/1 6.2.1.3 6.2.1.3 RPA 15

6.2.1.1 Standard circuit diagram symbols

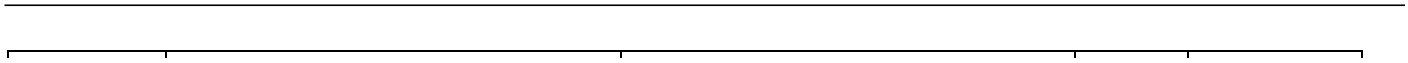
Answer 02 · Mark scheme

01.6	power = 0.32 × 0.50 power = 0.16 (W)		1 1	AO2 6.2.4.1
01.7	charge flow = 0.50 × 17 8.5 (C)		1 1	AO2 6.2.1.2
01.8	a straight line through the origin with a lower gradient		1	AO1/2 6.2.1.3 RPA 15
Total			**12**	

6.2.1.1 Standard circuit diagram symbols

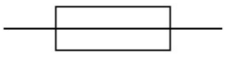
Answer 02 · Mark scheme

November 2020 | 8464/P/1F | Original Q1



6.2.1.1 Standard circuit diagram symbols

Answer 03 · Mark scheme November 2020 | 8464/P/1F | Original Q5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	swap the blue wire and the green and yellow wire	allow connect the blue wire to the neutral pin and the yellow and green wire to the earth pin. allow swap the earth and neutral wires ignore the earth wire and neutral wire are wrongly connected	1	AO2 6.2.3.2
05.2	230 (V) 50 (Hz)		1 1	AO1 6.2.3.1 6.2.3.2
05.3	0 (V)		1	AO1 6.2.3.2
05.4			1	AO1 6.2.1.1
05.5	the person could get an electric shock because there is a current in the person	allow so the person could be electrocuted allow because the person provides a connection (from the washing machine) to earth allow because there is a potential difference across the person	1 1	AO3 6.2.3.2

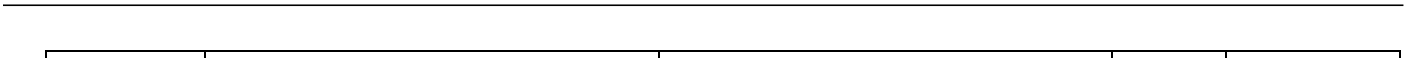
6.2.1.1 Standard circuit diagram symbols

05.6	the charge flows through the earth wire (instead of the person) because the resistance of the earth wire is much less than that of a person	 allow so the case does not become live allow so the fuse will break / melt / blow	1 1	AO3 6.2.3.2
Total			**9**	

6.2.1.1 Standard circuit diagram symbols

Answer 03 · Mark scheme

November 2020 | 8464/P/1F | Original Q5



6.2.1.1 Standard circuit diagram symbols

Answer 04 · Mark scheme

November 2021 | 8464/P/1F | Original Q3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1			1	AO1 6.2.1.1
03.2	the flow of electrical charge		1	AO1 6.2.1.2
03.3	all 4 components connected in a series circuit	allow a cell instead of a battery allow an LED or LDR symbol instead of a lamp ignore the + sign on the battery symbol	1	AO3 6.2.1.1 6.2.2
03.4	decrease the resistance of the variable resistor		1	AO1 6.2.1.3
03.5	P = 0.75 × 0.16 P = 0.12 (W)		1 1	AO2 6.2.4.1
03.6	charge flow = current × time Q = It		1	AO1 6.2.1.2

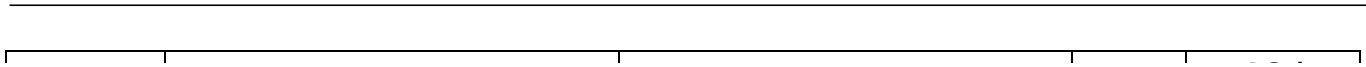
6.2.1.1 Standard circuit diagram symbols

03.7	200 mA = 0.2 A charge flow = 0.2 × 15 charge flow = 3.0 (C)	 allow a correct substitution using an incorrectly/not converted value for current allow a correct calculation using an incorrectly/not converted value for current	1 1 1	AO2 6.2.1.2
03.8	1.6		1	AO3 6.2.1.2
03.9	260 mA to 380 mA		1	AO2 6.2.1.2
Total			**12**	

6.2.1.1 Standard circuit diagram symbols

Answer 04 · Mark scheme

November 2021 | 8464/P/1F | Original Q3



6.2.1.1 Standard circuit diagram symbols

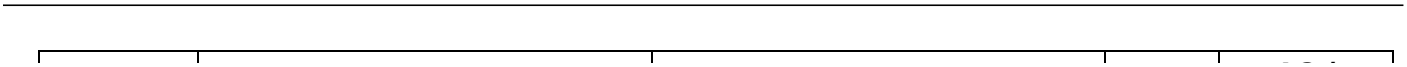
Answer 05 · Mark scheme November 2021 | 8464/P/1F | Original Q5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	$V = I\ R$		1	AO1 6.2.1.3
05.2	3.9 = 0.12 × R $R = \frac{3.9}{0.12}$ R = 32.5 (Ω)	 allow R = 33 (Ω)	1 1 1	AO2 6.2.1.3
05.3	energy = power × time **or** E = P t		1	AO1 6.2.4.2
05.4	time = 150 000s energy = 0.46 × 150 000 energy = 69 000 (J)	 allow a substitution using an incorrectly/not converted value of time allow a correct calculation using an incorrectly/not converted value of time	1 1 1	AO2 6.2.4.2
05.5	thermistor		1	AO1 6.2.1.1
05.6	the current will increase (because) the resistance decreases		1 1	AO1 6.2.1.4
Total			**11**	

6.2.1.1 Standard circuit diagram symbols

Answer 05 · Mark scheme

November 2021 | 8464/P/1F | Original Q5



6.2.1.1 Standard circuit diagram symbols

Answer 06 · Mark scheme June 2022 | 8464/P/1F | Original Q1

Question 1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	battery		1	AO1 6.2.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.2	variable resistor	allow resistor allow battery / cells allow correct circuit symbol	1	AO1 6.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.3	subtract 0.4 volts from each reading		1	AO1 6.2.1.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.4	mean = $\frac{0.54+0.58+0.53}{3}$ mean = 0.55 (A)	allow mean = $\frac{1.65}{3}$	1 1	AO2 6.2.1.3

6.2.1.1 Standard circuit diagram symbols

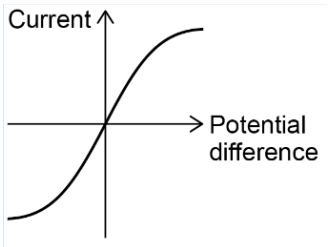
Answer 06 · Mark scheme

June 2022 | 8464/P/1F | Original Q1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.5	$P = 4.8 \times 0.75$ $P = 3.6$ (W)		1 1	AO2 6.2.4.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.6	$R = \frac{4.8}{0.75}$ $R = 6.4$ (Ω)		1 1	AO2 6.2.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.7	increase increase		1 1	AO1 6.2.1.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.8			1	AO1 6.2.1.4

Total Question 1		12

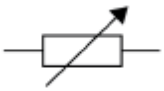
6.2.1.1 Standard circuit diagram symbols

Answer 07 · Mark scheme

June 2024 | 8464/P/1F | Original Q4

Question 4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	voltmeter symbol correct voltmeter connected across diode	 allow voltmeter connected across diode and ammeter	1 1	AO1 6.2.1 6.2.1.4 RPA16

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.2			1	AO1 6.2.1 6.2.1.4 RPA16

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.3	random		1	AO3 6.2.1.4 RPA16

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.4	$\frac{0.27 + 0.32 + 0.31}{3}$ 0.3 (A)	 allow 0.30 (A)	1 1	AO2 6.2.1.4 RPA16

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.5	both points plotted correctly line of best fit	allow a tolerance of ± ½ small square ignore line before 0.5 V	1 1	AO2 6.2.1.4 RPA16

6.2.1.1 Standard circuit diagram symbols

Answer 07 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.6	non-linear		1	AO2 6.2.1.4 6.2.1.4 RPA16

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.7	the current decreased to 0.00 A		1	AO1 6.2.1.4 6.2.1.4 RPA16

Total Question 4	**10**

6.2.1.1 Standard circuit diagram symbols

Answer 08 · Mark scheme

June 2025 | 8464/P/1F | Original Q2

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	symbols for filament lamp, ammeter and cell used a simple complete series circuit	allow **1** mark for 2 correct circuit symbols MP3 dependent on scoring at least **1** other mark	2 1	AO1 6.2.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.2	cell		1	AO1 6.2.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.3	$Q = 1.5 \times 30$ $Q = 45$ (C)		1 1	AO2 6.2.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.4	$R = \frac{12}{1.5}$ $R = 8$ Ω	 allow 8.0 allow ohms	1 1 1	AO2 AO2 AO1 6.2.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.5	as potential difference increases, the current increases non-linear relationship	 allow at a decreasing rate	1 1	AO3 6.2.1.4

6.2.1.1 Standard circuit diagram symbols

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.6	(resistance) increases		1	AO1 6.2.1.4

Question	Answers	Mark	AO / Spec. Ref.
02.7	**Level 2:** Relevant points (reasons / causes) are identified, given in detail and logically linked to form a clear account.	3–4	AO3
	Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.	1–2	AO2 6.2.4.2
	No relevant content	0	
	Indicative content • both types of bulb have equal brightness • the same number of bulbs are needed • LED bulbs do not need to be replaced as often **power comparison** • the input power of filament lamp is greater • the input power of the filament lamp is 32 W greater • the input power of filament lamp is 5 times greater • the brightness per watt for the LED bulb is 100 arbitrary units • the brightness per watt for the filament lamp is 20 arbitrary units **consequence** • LED bulb transfers less energy • (number of units of) electricity used is lower for LED bulb • LED bulb wastes less energy • LED bulb running costs are lower • the LED bulb is more efficient • the LED bulb is 5 times more efficient for **Level 2** answers must include a valid calculation		

Total Question 2	**16**

6.2.1.1 Standard circuit diagram symbols

Answer 04 · Examiner comments November 2021 | 8464/P/1F | Original Q3

Question 3 (Low/standard demand)

03.1 Slightly over half the students knew the symbol for a filament lamp.

03.2 Nearly three quarters of all students answered this correctly.

Answer 04 · Examiner comments November 2021 | 8464/P/1F | Original Q3

03.3 This question was testing whether students were able to draw four components in series. A complete circuit was needed, with no gaps around the components. Many students drew the components at right angles to the wires, and therefore not connected into the circuit. Students were given the symbols in the question, and were expected to draw them correctly, so those who drew a line through the middle of the ammeter, for example, did not gain the mark. Roughly 45% of students gained this mark, with almost 10% not attempting the question at all.

03.4 Just over 40% of students answered correctly, with more than a third opting to place an additional ammeter in the circuit.

03.5 Over 90% gained both marks.

03.6 Just under half the students correctly recalled the equation, but almost 1 student in 8 did not attempt to answer.

03.7 A fair proportion of students attempted to convert 15 seconds into minutes, and then multiplied this by 200, gaining no marks. It was uncommon for students to attempt to convert milliamps into amps. Just over half of all students gained at least 2 marks.

03.8 Many students struggled to answer this question, and less than a quarter of students answered correctly.

03.9 Around than one in ten students selected the correct answer. Roughly a third of students selected the third option, suggesting that the vast majority of these students were not familiar with the ± symbol.

6.2.1.1 Standard circuit diagram symbols

Answer 05 · Examiner comments November 2021 | 8464/P/1F | Original Q5

Question 05 (Standard demand)

05.1 Slightly over a third of students selected the correct equation.

05.2 Full marks were gained by approximately a third of the students, with more than 50% failing to gain any credit.

05.3 This equation was correctly recalled by slightly less than half of students.

05.4 Most students did not attempt to convert 2500 minutes into seconds. Very few students gained all 3 marks, although over 60 % gained at least 2 marks.

05.5 Only a very small proportion of foundation tier students were able to correctly identify the symbol for a thermistor.

05.6 Most students failed to recognise that the resistance of the thermistor would decrease as temperature increased, with many students stating that because the potential different across the thermistor was constant, the current in the thermistor must also be constant. Another misconception demonstrated in a number of responses was that the current would increase because the increased temperature gives the current more energy. Nearly one in five students did not attempt the question.

6.2.1.1 Standard circuit diagram symbols

Answer 06 · Examiner comments June 2022 | 8464/P/1F | Original Q1

Question 01 (Low demand)

01.1 This multiple-choice question was answered correctly by around 80% of students.

01.2 Slightly more than 40% of students answered this question correctly.

Many students gave the answer of voltmeter, perhaps suggesting that they did not read the word “adjust” in the question.

01.3 Just under 40% of students answered this question correctly.

01.4 Nearly three quarters of all students gained both marks in this calculation.

Some students incorrectly tried to use the number 2.5 in their calculations, for example adding the three currents and dividing by 2.5, or by adding 2.5 V to the sum of the currents before dividing. These responses gained no marks.

01.5 Nearly 90% of students correctly substituted into the equation and calculated the correct answer.

01.6 Almost 90% of students gained both marks for this calculation.

01.7 While almost all students gained at least one mark on this question, only about 15% gave both correct answers.

01.8 Around 60% of students identified the correct graph.

6.2.1.1 Standard circuit diagram symbols

Answer 07 · Examiner comments

Question 4 (low & standard demand)

04.1 While the majority of students demonstrated that they recalled the symbol for a voltmeter, a small minority were able to position the voltmeter in parallel with the diode.

04.2 Nearly 60% correctly identified the variable resistor as the component that should be used to adjust the potential difference across the diode.

04.3 Around a quarter of students correctly identified that fluctuations in readings, when everything else remained the same, must be examples of random error. The most common answer given was systematic errors.

04.4 This question was generally well answered, with nearly three-quarters of all students gaining both marks. Errors seen from those who did not score any marks included multiplying the numbers together instead of adding them, forgetting to divide the answer by 3, and giving the median value instead of calculating the mean.

04.5 There were many good attempts at drawing the line using a sharp pencil, and clearly marking the points with a cross.

Many students accurately plotted the points on this graph. A lower proportion managed to draw a valid line of best fit, with around 30% of students gaining full marks for the question. A relatively common incorrect attempt at the line was to draw a single straight line.

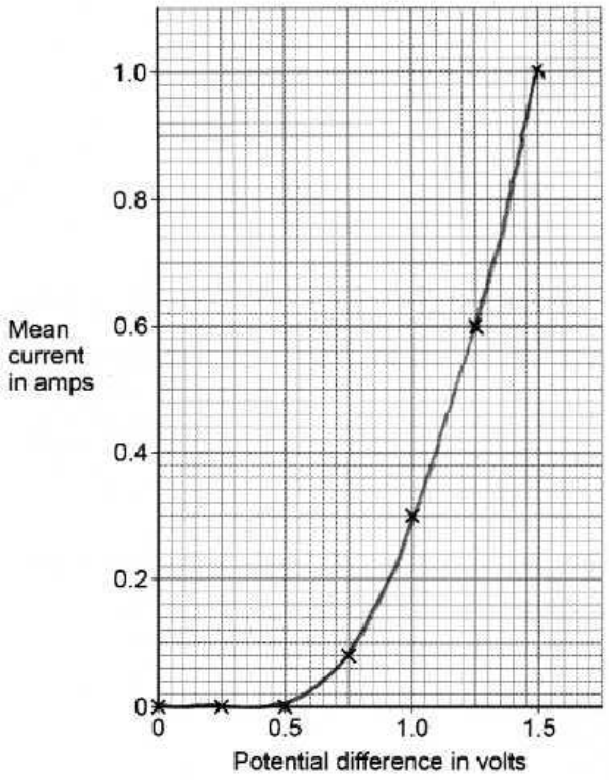
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6.2.1.1 Standard circuit diagram symbols

Answer 07 · Examiner comments June 2024 | 8464/P/1F | Original Q4

Figure 7 shows some of the results.

Figure 7



A good example of a well-plotted graph. This student scored both marks.

04.6 Approximately a third of students correctly described the current-potential difference relationship for a diode as non-linear.

04.7 Slightly less than 40% of students recalled that, when reversed, the current in a diode becomes 0.00 A. Slightly more than 40% ticked the box to suggest that the current would remain the same.

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6.2.1.1 Standard circuit diagram symbols

Answer 08 · Examiner comments

June 2025 | 8464/P/1F | Original Q2

Question 2 (Low demand)

02.1 This question discriminated well and produced a good spread of marks. 35% of students gained 3 marks for selecting the correct circuit symbols and drawing a simple complete series circuit. 70% of students made one error and were awarded 2 marks. Most of the students that scored 2 marks selected an incorrect circuit symbol, but some did select them correctly but could not draw a simple complete series circuit. 10% of students gained 1 mark for 2 correct circuit symbols.

02.2 65% of students correctly identified the cell as the source of energy for the circuit.

02.3 This low demand calculation was well answered with 90% of students gaining both marks. Some students did an unusual conversion of time, dividing 30 by 100.

02.4 85% of students correctly calculated the resistance of the filament lamp and gained both calculation marks. The unit mark was awarded independently, and 60% of students selected the correct unit.

02.5 65% of students gained a mark for describing the current increasing as the potential difference increases. Only a small number of students described the relationship as being non-linear.

02.6 Only 30% of students described the resistance of the filament lamp increasing as the temperature increases.

02.7 This question discriminated well and produced a good spread of marks. Approximately 50% of students wrote Level 2 responses and gained either 3 or 4 marks. 40% of students wrote Level 1 responses because they did not include a calculation. Only a very small number of students did not write anything creditworthy, and a very small number did not attempt the question.

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